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Eco Village Eco Buildings Construction and Energy Performance

SERVE Deliverable D2.7

CONCERTO INITIATIVE
SERVE

Sustainable Energy for the Rural Village Environment

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1 Introduction

Figure 1-1: Eco Village Solar Park

Within the SERVE project a key component was supporting the development of the Eco Village in Cloughjordan. This Eco Village aims to build a total of 132 buildings at its site in Cloughjordan which will be heating using renewable energy. Through the life of the SERVE project adjustments had to be made to the overall targets within the Eco Village development as a result of the downturn in the economy and challenges in financing construction projects. This report highlights the key achievements during the project and discusses the energy performance achievements.

1.1 Key Objectives

The key objectives for eco building construction within the Eco Village were:

- To construct 10,000m2 floor area of Residential Buildings with Heat Energy Rating (HER) of 70 kWh/m^2/year (30% below 2006 National Building Standards)) through the use of passive solar design, insulation levels 30% above 2006 National Building Standards and high levels of heating controls.
- To construct two community buildings, equating to 1,106m2 with Heat Energy Rating (HER) of 70 kWh/m^2/year (40% below current building regulations for such buildings).
- To reduce energy demand by 1000 MWh/year compared to similar buildings constructed to current National Regulation standards.
- To monitor and publish energy use and demand in all buildings and allow for demonstration of the cost-effectiveness of a holistic design approach and provide feedback to energy users.

1.2 Summary of Achievements

- Building activity at the Eco Village started in March 2009 following delays associated with the completion of infrastructure & planning permission. It continued throughout the lifetime of the Serve project and continues into 2013.

- SPIL members set up the entity 'Oxpark Construction' to manage all aspects of site building activity, with particular responsibility to ensure that all site activities complied with national 'Health & Safety legislation. No accidents were reported during the four years of Serve building activity.
- A total of 45 Residential Buildings equating to 8,307m^2 of residential built area are construction complete at end of November 2012.
- Building activity continues at the Eco Village with a Total of 54 sites either in the **Complete** or **In-progress** category.

Figure 1-2: Eco Village Entrance Area Nov 2012

- The average Energy Rating of completed Residential Buildings in the Eco Village is 56.5kWh/m^2 /yr. This is more than 20% better than the SERVE target of 70kWh/m^2 /yr.
- The average expected heat energy demand (delivered energy) of the eco buildings is expected to be 465MWhrs per year compare to 830 MWhrs/yr for reference buildings built to the 2006 Building Regulations. This represents an annual reduction of 365MWhrs/yr in delivered heat energy demand for the buildings.
- The average Air Tightness of the completed residential Buildings are almost 300% better than national building standards at 2.66m3(m2.hr).
- There are 2 Non Residential buildings completed at the Eco Village. The combined floor area of the completed buildings is 1,123m^2 which achieves the SERVE target of 1,106m^2 Non residential building floor area.
- The SERVE project has part funded a 'Target Energy Efficiency Support Scheme' for Eco Village buildings where the buildings can demonstrate, through a nationally registered Building Energy Rating certificate, that the building has achieved the required energy values required by the Serve project.
- A total of 84 Eco Village sites have been sold to date.
- Full Planning Permission exists on all sites at the Eco Village.

2 Eco Buildings Construction

The achievements within the Eco Village can be measured against two main indicators;

1. The total constructed buildings and floor area of Residential and Non-Residential buildings.
2. The measured Energy Performance of Residential and Non-Residential buildings.

Figure 2-1: Launch of Eco Village Phase 2

Objective 1 set out to construct Residential buildings with a combined floor area of 10,000m^2 and construct 2 Non-Residential Buildings with a combined floor area of 1,106m^2 by M60.

Objective 2 was to ensure that the Energy Performance of the constructed Residential buildings are 70kWh/m^2 /yr (30% better than national building energy standards at the beginning of the Serve project) and that the Non-Residential buildings also achieve 70kWh/m^2/yr (40% better than national building standards at the beginning of the Serve project).

2.1 Construction of Residential Buildings

There are a total of 132 residential sites at the Eco Village. These sites are a varied mix of detached, semi-detached, terrace and apartment types.

A total of 110 sites, from a total of 132, have full planning permission for residential construction. A total of 83 sites are sold. A range of sales strategies have been put in place to sell the remaining sites.

In the face of a difficult domestic economic climate during the lifetime of the Serve project, SPIL worked in innovative ways to try and continue its site sales programme and complete the entire 132 buildings. However this was not possible to achieve within the time frame of the SERVE project.

The initial target of the SERVE project was to construct 66 houses during a phase 1 build programme ending M18 and the remainder during a phase 2 programme ending M36.

In M36 these building targets were revised, in agreement with the EU Commission, to reflect the status and building projections of the time which had altered dramatically from the original construction plan. This revision was necessary due to a number of factors outside of the control of Sustainable Projects Ireland Ltd. These factors included a severe downturn in the national economy, infrastructure delays caused by contractor reworks to the built waste water piping network & planning delays experienced with the local authority which impacted the residential building construction start date and programme.

Revised Targets were agreed for the period up to M48 which included:

- 10,000 m^2 of residential floor area or 70 buildings constructed by Month 48
- 1,106 m^2 of non-residential floor area or 2 buildings constructed by Month 48
- Finalisation of buildings and relevant Handover Certificates by Month 60

The history of the Residential and Non-Residential building completion activity can be summarised as follows:

Eco Village Building Construction Complete						
	M01 to M12	M13 to M24	M25 to M36	M37 to M48	M48 to M60	Totals
Residential Building	0	17	11	10	7	45
Non-Residential Buildings	0	0	1	0	1	2
Residential Floor Area m^2	0	3645	1717	1585	1361	8308
Non-Residential Floor Area m^2	0	0	588	0	599	1187

Table 2-1: Total Residential Completed Buildings by November 2012 = 8,308.72m2

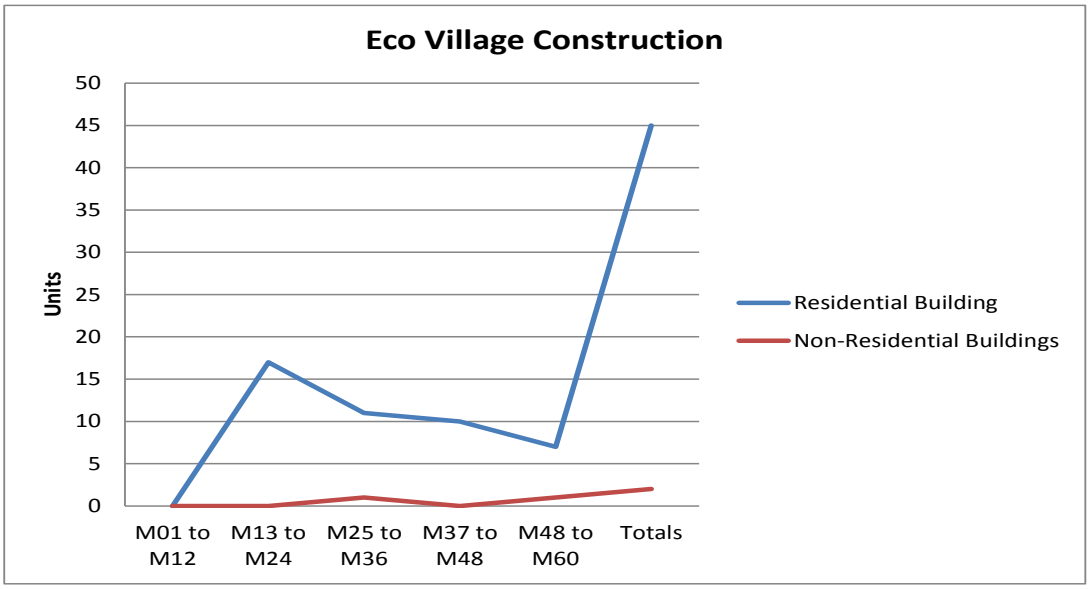

Figure 2-2: Eco Village Completed Buildings by Date

Oxpark Construction Ltd, the entity established by SPIL to manage the building activity on the Eco Village site, agreed a target Construction Plan which endeavoured to achieve 30 houses started by the end of 2009. This was achieved and completed the Phase 1 construction started milestone.

17 sites completed in 2009, 11 in 2010, 10 in 2011 and a further 07 in 2012. This yielded a total constructed Residential floor area of 8,307m^2 .

The project benefitted from the construction of greater than anticipated average floor areas for the housing. Initial estimates of average floor areas for housing at the Eco Village was 120m^2 . This has been exceeded by almost 40% with the average floor area of houses constructed at the Eco Village measuring 185m^2 . This has enabled SPIL to achieve a good return on 'total floor area' constructed with fewer built houses.

Approximately another 4,500 to 7,000m^2 of residential buildings could be constructed if all the remaining sold sites at the Eco Village were developed. However due to the personal complexities of the individual site owners lives in terms of moving family, funding their house build etc it is accepted that these completions will take a number of years to realise.

Building activity continues into 2013 and will continue for the foreseeable future. 6 new constructions, due to finish in 2013, are in progress at the present time with a further 3 new builds scheduled to start

in 2013 also. Sustainable Projects Ireland Ltd are confident that the project will eventually realise completion albeith in a longer time frame than could have been imagined when the Serve project began.

2.2 Construction of Non Residential / Community Buildings

The Eco-Village development plan includes the development of up to five Non-Residential or Community Buildings. These consist of the following:

1. Community Hostel
2. Enterprise Building
3. Welcome Building (Historic Coach House)
4. East Community Building
5. West Community Building

The Serve target of Non Residential Buildings by M60 is 1,106m^2 from two buildings. The Community Hostel Building and Enterprise Building have been completed with a total floor area of community buildings achieved is 1,187m^2 .

2.2.1 Community Hostel Building;

This Non Residential building of 588m^2 was completed and opened to the public in June 2011. This state of the art, energy efficient, accommodation building has played an important role in providing on site accommodation to the many interested visitors & course participants that the Eco Village is attracting through its education remit and charitable status.

Figure 2-3: Eco Village Eco Hostel

A hostel is not a typical building in that it caters for members of the public staying overnight requiring public access, which requires a Fire Certificate issued by the local authority Fire Officer. To comply with fire regulations the Hostel building is compartmentalised in its design and construction. This includes the ground floor, the first floor, the second floor, and all escape routes leading to the escape box [the stairwell and fire exit]. Concrete was the only material acceptable for the escape box. While other materials may be acceptable elsewhere but the cost implications to attain the required standard were prohibitive for the owner.

This reality necessitated the building of the Eco Hostel using a building method of wall construction called Insulated Concrete Form (ICF). The Hostel ICF consists of exterior insulation panels of 1.2 metres long, 0.4 metres high, and 120mm thick, high density polystyrene. The system is based on a reinforced concrete core, which provides the necessary structural integrity, noise attenuation and durability to the building. The polystyrene panels provide the thermal insulation to the structure, with a U-value as low as 0.19W/m²K.

With ICF construction the hostel acts as a huge storage heater – because of the thermal mass property inherent in it's construction. The heat created inside the building is stored inside the walls and feeds efficiently back into the premises unhindered by insulation. There is no insulation on the interior walls. The roof and exposed floor are also highly insulated.

The method used to determine the Building Energy Rating of non residential buildings is called the Simplified Building Energy Model (SBEM). The calculated Delivered Energy (using iSBEM Software) is 169.83 kWh/m^2 /yr for the Hostel Building. This energy value is 45% better than the calculated figure for the Reference Building on iSBEM. The Reference Building is the same building built to typical build methods similar to 2005 building regulations which the performance of Eco Buildings are measured against. Air Tightness Test for the hostel building came in at 2.907 $m^3/(h.m^2)$

The U-Values achieved for the main elements are as follows:

1) Floor = 0.12
2) External Wall = 0.19
3) Main Roof + Flat Roof forming Balcony for apartment = 0.17
4) Flat Roof Laundry Room = 0.20

2.2.2 Enterprise Centre

Completed in 2012 and comprising of 599m^2 of built floor area the Eco Village Enterprise centre will be the future hub of business activity that will allow sustainable business ventures to grow and thrive in the community.

A partnership entity called NTGEP Ltd (North Tipp Green Enterprise Park) was established to manage the construction of the enterprise centre. NTGEP will ensure that this building will provide an arena for Business, Enterprise and Employment, while adhering to the Ecovillage Charter and the energy targets set by SERVE.

The building was designed and built to a high energy standard. The composite wall and roof product called KS1000 and KS2000, supplied by Kingspan are through-fixed wall systems which can be laid vertically or horizontally. The systems provide simple and fast site installation with options of valley or crown fixings, using matching colour headed fasteners. Both systems provide reliable thermal and low air leakage performance with long term lifecycle durability.

The building is naturally ventilated and achieved an Air Tightness Test value of 4.8$m^3(m^2.hr)$ which is 100% better than current national building regulations.

Figure 2-4: Eco Village Enterprise Centre

The building will be naturally day-lit with a double height entrance atrium. The lighting levels have been carefully modeled by Overy and Associates (Building Services Engineers) and low energy lighting options are provided where possible.

Foundations are laid using GGBS low embodied CO_2 concrete and insulated to a very high standard having a U-Value of 0.1W/m^2/K, not typical for this type of building. There is vertical perimeter of insulation around the entire footprint and under floor heating is installed.

The building is heated from the District Heating network of the Eco Village and is designed with 2 X 800L buffer storage tanks which supply the buildings heating and hot water needs.

This Enterprise Centre development will inject substantial infrastructure into the Cloughjordan Ecovillage, and make a significant contribution to a community working to build a resilient economy, sustained by local companies, green enterprises, eco-tourism, social entrepreneurs and strategic partners. This Enterprise Centre will provide flexible, affordable, mixed use co-working and community enterprise workspace in Cloughjordan Co Tipperary, a village which is becoming a growing hub for 'green know how'.

The 'green knowledge economy' is characterised by a transition to a more environmentally sustainable version of the knowledge economy. It is relevant to all business sectors and provides a pathway for the local rural economy, which is rich in natural capital, to also become high knowledge and low carbon.

3 Eco Buildings Energy Analysis and Performance

Analysis of the Residential Buildings constructed at the Eco Village shows that their energy performance exceeds the SERVE targets by 20%. The average Heat Energy rating of residential Buildings is 56.5 kWh/m^2/yr. The SERVE Delivered Energy target for Eco Buildings is 70 kWh/m^2/yr.

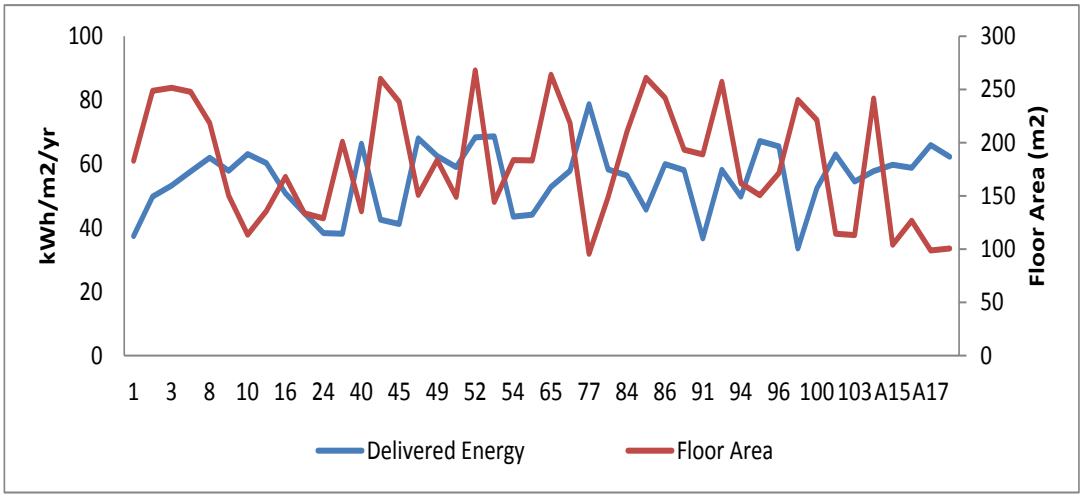

Figure 3-1: Energy Demand and Floor area of Eco Village Buildings

From the chart above we can see some examples of how the energy needs, floor area and building type are intertwined for different building types. For example House 1 has a floor area of over 200m2, is built to a very high specification (passive standard) and has a very low energy demand. House 77 has a small floor area, less than 100m2, yet has a high energy demand due to its orientation and use of natural materials in its construction (Hemp/Lime walls).

3.1 Reduced Energy Need

The chart below is a comparison of the average energy needs of the 'Eco Buildings' with the average energy needs of the 'Reference Buildings' we can see how much better the Eco Buildings are expected to perform. The Eco Buildings are performing at 56 kWh/m2/yr compared to 100 kWh/m2/yr for the reference buildings.

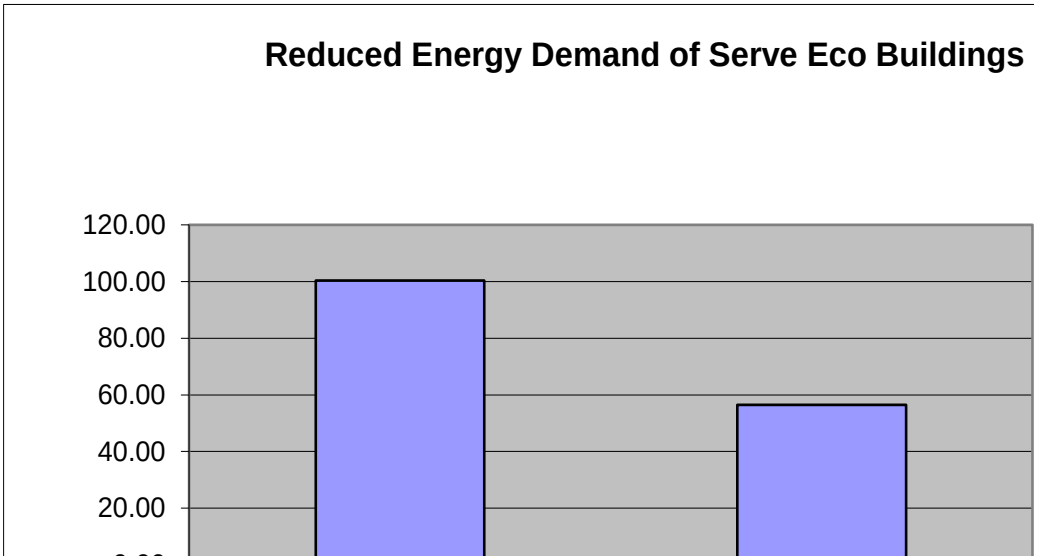

Figure 3-2: Comparison of Eco Village and Reference Building Performance

3.2 Reduced Energy Demand per Year of Eco Buildings-

Analysis of the Eco Buildings annual energy consumption in MWhrs/yr demonstrates the significant energy savings which will be achieved on an annual basis by the Eco Buildings compared to the reference buildings that the Serve project is measured against.

The average expected heat energy demand (delivered energy) of the eco buildings is expected to be 465MWhrs per year compare to 830 MWhrs/yr for reference buildings built to the 2006 Building Regulations. This represents an annual reduction of 365MWhrs/yr in delivered heat energy demand for the buildings. The Serve project had a target primary energy reduction of 1000MWhrs/yr for the initial planned construction of 13,200m^2. . Converting the achieved savings to primary energy and including electricity the total savings are 500MWh/yr. Extrapolating to a total floor area of 13,200m^2 indicates that the projected savings would have been approximately 800MWh/yr. here also..

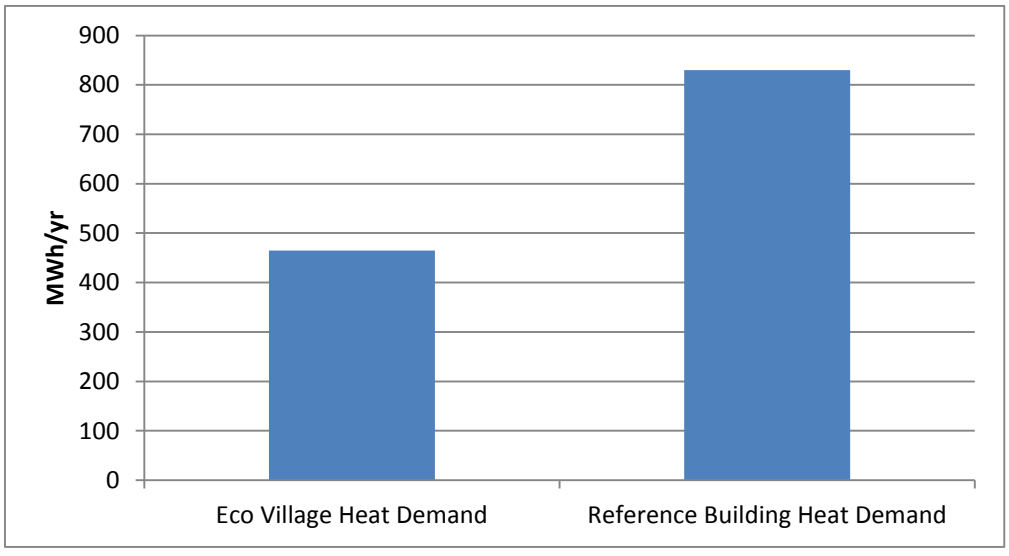

Figure 3-3: Comparison of Eco Village Total Heat Demand vs Reference Building Heat Demand

3.2.1 U-Value Comparison-

The main U-value components of dwelling are Wall, Floor and Roof. Below is a comparison of these three elements on the buildings at the eco village. A number of the buildings used alternative building materials for wall construction such as COB or Lime/Hemp. The bar chart below identifies these sites with the higher than average wall U-values. These sites compensate for this lower element in their walls by employing better than average U-value materials in other areas.

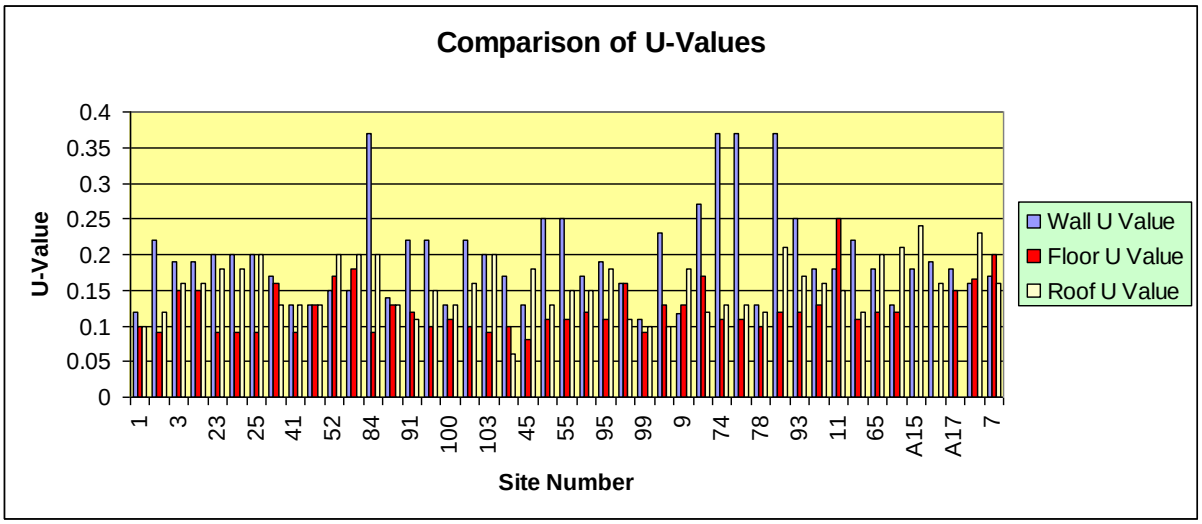

Figure 3-4: Eco Village Building U – Values

3.2.2 Air Tightness Testing-

Although not a mandatory requirement of the Eco Buildings to perform air tightness testing and not a mandatory requirement of the national building regulations, 42 of the total 45 residential buildings at the Eco Village carried out air tightness testing on their completed builds. Also the 2 Non residential buildings completed air tightness testing. However SPIL encouraged its members to carry out air tightness testing and offered an enticement through the 'Serve target support scheme' to have such an analysis completed on their builds. SPIL encouraged a value of $3m^3(m^2.hr)$ which was a challenge since current national building regulations only encourage a value of $7m^3(m^2.hr)$.[1]

[1] The 2006 Regulations require a value of $10m^3(m^2hr)$. This was revised in 2008 to 7 $m^3(m^2hr)$

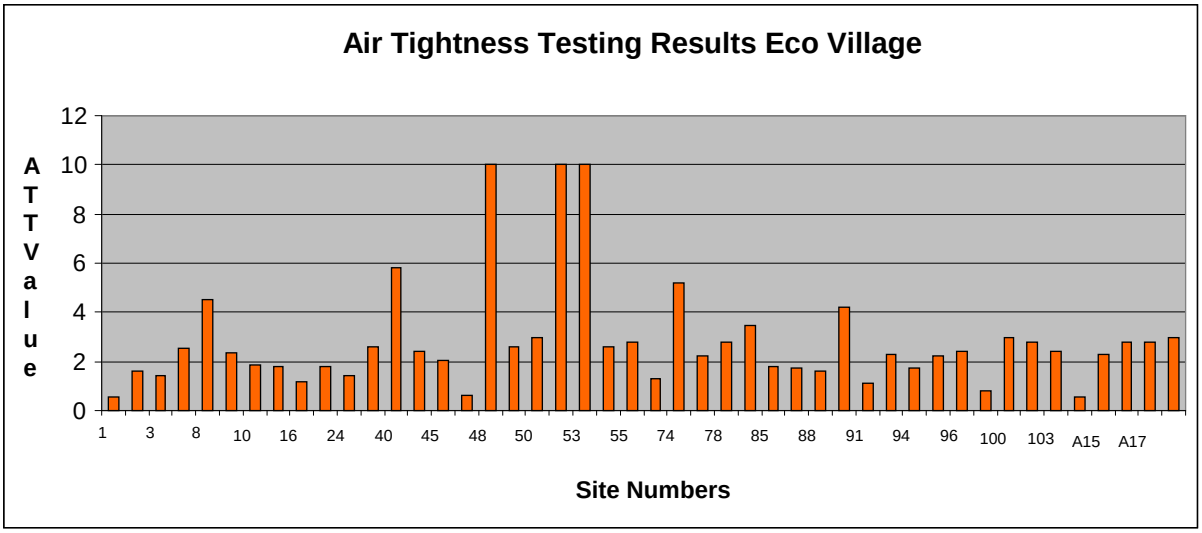

Figure 3-5: Air Tightness Test Results within Eco Village

Of the 42 that carried out testing 37 achieved the required value of 3m^3(m^2.hr) with 2 buildings achieving Passive House standard values of less than 0.6m^3(m^2.hr). The values shown in the bar chart above include the 3 houses which did not complete a test, these houses carry a default value of 10 within the National Building Energy Rating (BER) methodology.

Both Non Residential buildings also achieved excellent results for ATT with the Hostel building achieving a value of 2.8 m^3(m^2.hr) and the Enterprise building achieving a value of 4.8 m^3(m^2.hr).

3.2.3 Eco Buildings Target Support Scheme.

Achieving the SERVE energy targets was supported by the SPIL Energy Advisor and through the SERVE Target Support Scheme. The Eco buildings were encouraged to install the energy efficient measures required to meet the SERVE targets. These measures were supported financially by SERVE and paid to Eco Building owners once proof of successful implementation of the measures and achievement of the SERVE targets was established. To date there have been 34 Residential and 1 Non Residential applications for funding paid with a further 11 Target Support applications received and awaiting approval.

3.2.4 Case Study of Eco Building Residential House

Site 99 at the Eco Village is a 210m^2 , two story detached timber frame house. The house achieved an A2 Building Energy Rating and has a Delivered Energy value of 33.54KWh/m2/yr less than half the SERVE target.

The house was constructed by the owners and is classified by SPIL as a self build project.

Figure 3-6: House at Site 99

- **Walls**, factory built timber frame using 25% Irish sweet chestnut cladding followed inside by 50 X 38 treated battons and counter battons and 75% recycled glass hydraulic lime render on 22mm wood wool board externally, followed Tyvek UV façade membrane on 360 X 38 cellulose filled I beam stud with taped and sealed 38mm OSB ply. This is followed inside by a 38mm service cavity that is sheepswool filled and 12.5mm Fermacell board internally. U-Value = 0.11 W/m2K
- **Roof**, trussed timber rafter roof with cellulose insulation. Staneless steel standing seam roof with underlay on 12mm plywood on trussed timber rafters with 400mm cellulose insulation. 9mm taped and sealed smartply OSB, 100mm insulated service cavity, 12.5mm Fermacell Ceiling board. U-Value = 0.9 W/m2K
- **Floors**, superinsulated SuperGrund high density EPS insulated ring beam with 300mm EPS insulation underfloor slab. 100mm 50% GGBS 30 Newton polished concrete floor slab. U-Value = 0.098 W/m2K
- **Windows**, passive triple glazed, aluminium clad FSC pine windows, argon filled. U-Value = 0.79W/m2K
- **Heating**; metered heat from the District Heat network is supplied via a house heat exchanger and distributed to a 800 litre buffer storage tank. Th is tank supplies the house with Domestic Hot water and Heating. The house is heated using underfloor heating downstairs and wall heating upstairs.
- **Air Tightness**; the house was air tightness tested once construction was complete and achieved a value of 0.54 air changes per hour at 50 pascals.
- **Ventilation**; due to the high level of air tightness a mechanical heat and ventilation recovery system was installed. The syatem used is ‘Paul Novis’ HVAR unit with passive house institute certified to have a heat recovery rate of 93% and a fan power 0.61 W/l/sec.

Figure 3-7: Heat Exchange Unit in Dwelling

Attention was paid by the owner/builder in the selection of green and locally sourced materials where possible. Green materials used include; Fermacell Board, Glaster Recycled Glass lime Render, Wood Fibre Board, Cellulose & Sheepswoll Insulation materials, natural paints, recycled wood flooring, Irish grown Sweet Chestnut cladding, Ecocem cement & no MDF.

3.2.4.1 Site 99 Energy Performance

As discussed the Heat Energy Performance and Electrical Energy Performance of Eco Buildings has been recorded since the beginning of 2011. The graph below gives a record of the Heat Energy performance of site 99. Heat energy for space heating and domestic hot water is shown.

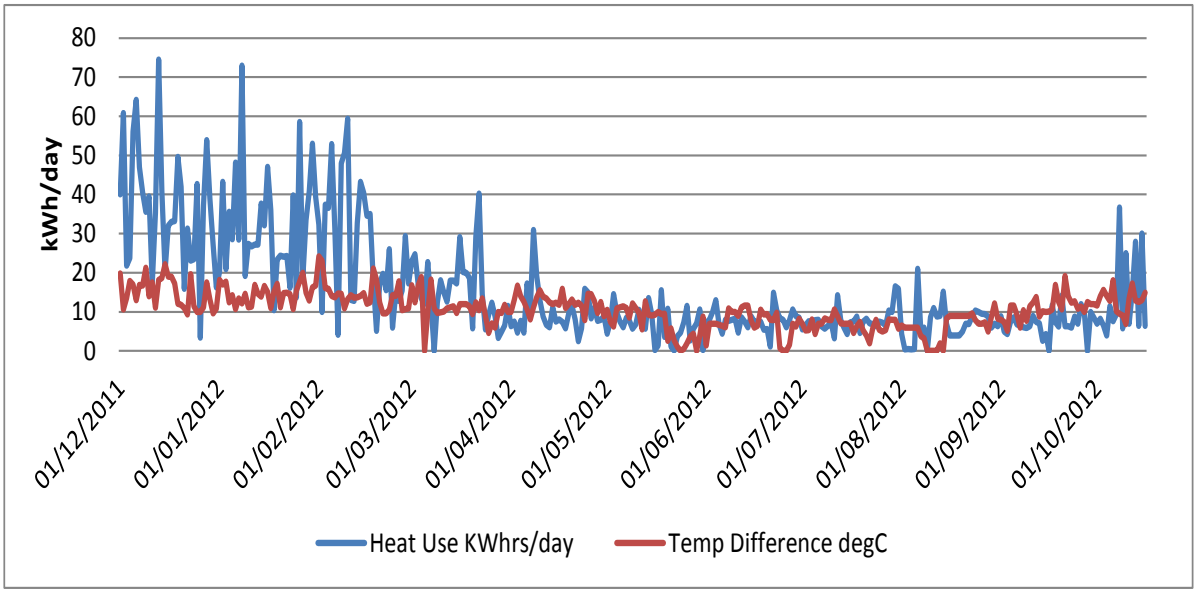

Figure 3-8: Heat Demand Site 99

As we can see the house performs well over the period recorded here. From December 2011 to October 2012 the house uses 3,404 kWh of energy for Heating and Hot Water. The average temperature difference during this time is 15.5 degrees.

The heating demand in winter is naturally higher than in summer but there is a base load required year round which accounts for the omestic Hot Water needs of the dwelling.

The Electrical energy use of Site 99 is recorded also. The house used 2,145kWh over the period December 2011 and December 2012. The average electrical energy use is 7kWh per day.

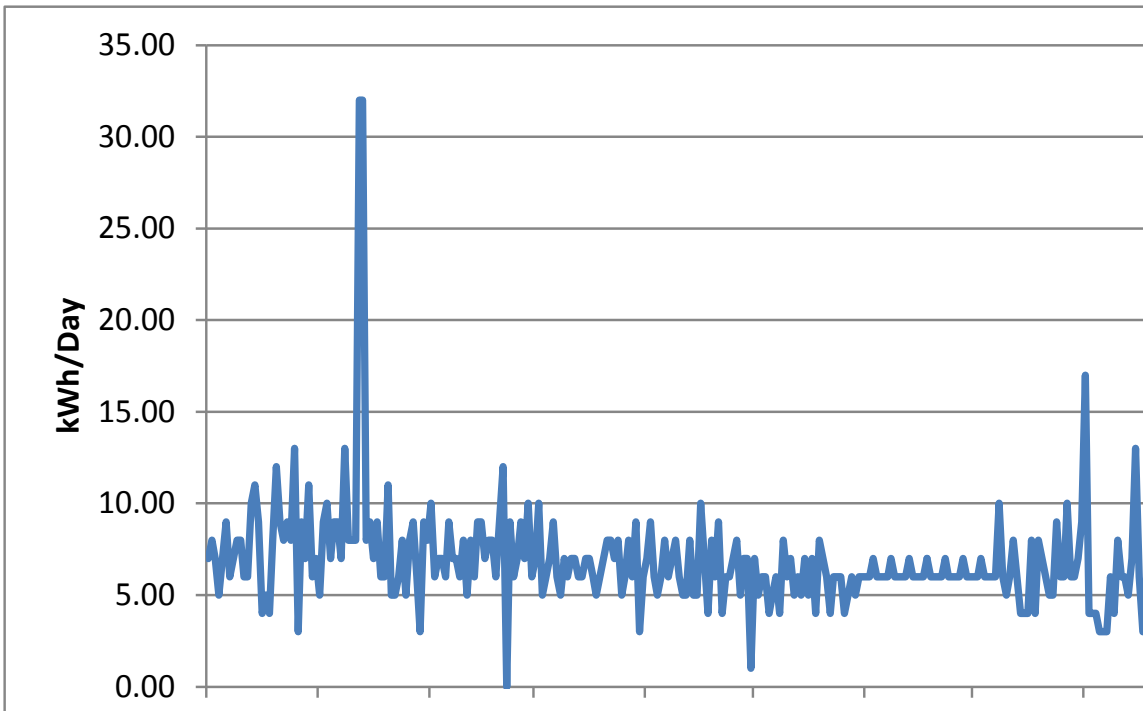

Figure 3-9: Site 99 Electricity Demand

3.2.5 Energy Monitoring

During 2011 and 2012, monthly readings of Heat Energy and Electrical Energy in the Eco Buildings were recorded on the last day of every month. This was done on a manual basis for all buildings up until April 2012. Thereafter most of the dwellings were networked for data collection of Heat Energy and the need to gather manual readings per dwelling has been reduced substantially with only Electrical Energy data being gathered manually.

3.2.5.1 Heat Energy Monitoring

Data relating to the Heat Energy usage in all buildings is collected & compiled in to a centralised spreadsheet month by month, providing data for Heat Usage monthly billing and consumption/performance analysis. The system for automating the collection of Heat Energy data in the buildings was rolled out in April 2012.

Figure 3-10: iMod Data Collection Device

An iMOD (data collector) was retrofitted to all dwellings over a period of 2-3 months. The iMOD collects data every 15 minutes from the house Metrimas fitted to the heat station in each bulding. A single file of data per house is extracted each night to a server in the SPIL Energy Centre where the District Heat Boilers are located. Each file has a unique site identifier name which is provided by the Metrima in each house. The data transfer is communicated by the ecovillage fibre optic broadband network, and the data server is maintained and managed by VINE (**Village Internet Network Engineering Limited)**, in conjunction with the Ecovillage Service Company/SPIL.

Results of this monitoring has enabled the analysis of rthe performance of buildings at the eco village to be compared to their design performance or Building Energy Rating. The graph below compares a selection of 25 Eco Buildings with their design energy rating.

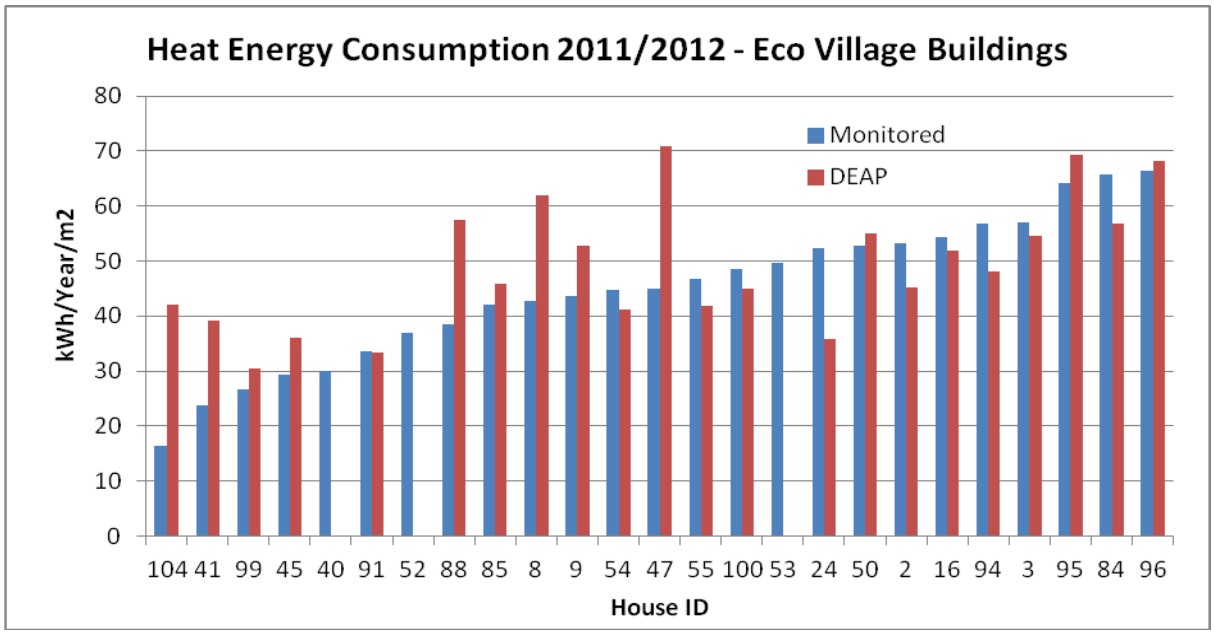

Figure 3-11: Distribution of heat consumption 2011-2012 (25 Eco Village Buildings

As can be seen all of the figures are below the 70 kWh/m^2 /year, which was the target for the ECO Village buildings (30% below 2006 National Building Standards). Moreover there is some correlation between the monitored and the DEAP data.

The average heating energy consumption in the 25 buildings is estimated at **44.85 kWh/m2/Year**. In DEAP the average figure is 48.68 kWh/m2/Year for 22 of these houses. The house with the lowest consumption (ID 104) is a "passive" house. There are no other passive houses included in the graph..

Further nalysis of the accumulated data has been carried out which has revealed a number of data accuracy issues in a number of dwellings. The information enabled SPIL to compare houses with similar BER ratings and actual heat energy usage whilst recording the occupancy. This information has established average energy consumption for various category of house in the ecovillage, over various seasons.

With this information SPIL has been able, in association with the Metrima equipment supplier, to have a recalibration of the house measuring equipment undertaken ensuring that the system is fine tuned for greater control and tighter operation. Also, where heat consumption appeared comparatively high, certain Merlin Heat Control settings have required a recalibration check by the equipment supplier. The success of the metering and monitoring undertaken by SPIL has increased residents confidence in the system and has enabled SPIL residents to better understand the system operation and control.

3.2.5.2 Electrical Energy Monitoring

Commencing in March 2012, Efergy electrical monitors have been installed in all occupied dwellings. These monitors display current electrical usage in the dwelling. The unit also stores up to 2 years worth of daily data. Until March 2012 the electricity readings were collected manually on a monthly basis and collated in a spreadsheet, month on month. Following the monitor rollout, the electrical energy data per house is downloaded in to a data file (ie 1 file per house). The file contains a daily sum of electricity usage, over a given period, per household. The collected files are collated in to a master spreadsheet.

Figure 3-12 : Efergy Electricity Meters

As per the DH data, there are also trends emerging regarding average usage per house type/occupancy.

The graph below shows the electricity consumption per building July 2011 - July 2012, and for 32 buildings with sufficient data. The building with the highest consumption among these buildings is the ECO Hostel. The average consumption is estimated at **2,886 kWh/Year/Building.** In one house where electrical energy appeared high in comparison to a similar house with similar occupancy an investigation by the home owner into the causes have resulted in a reduced monthly consumption and better understanding of energy use in the home.

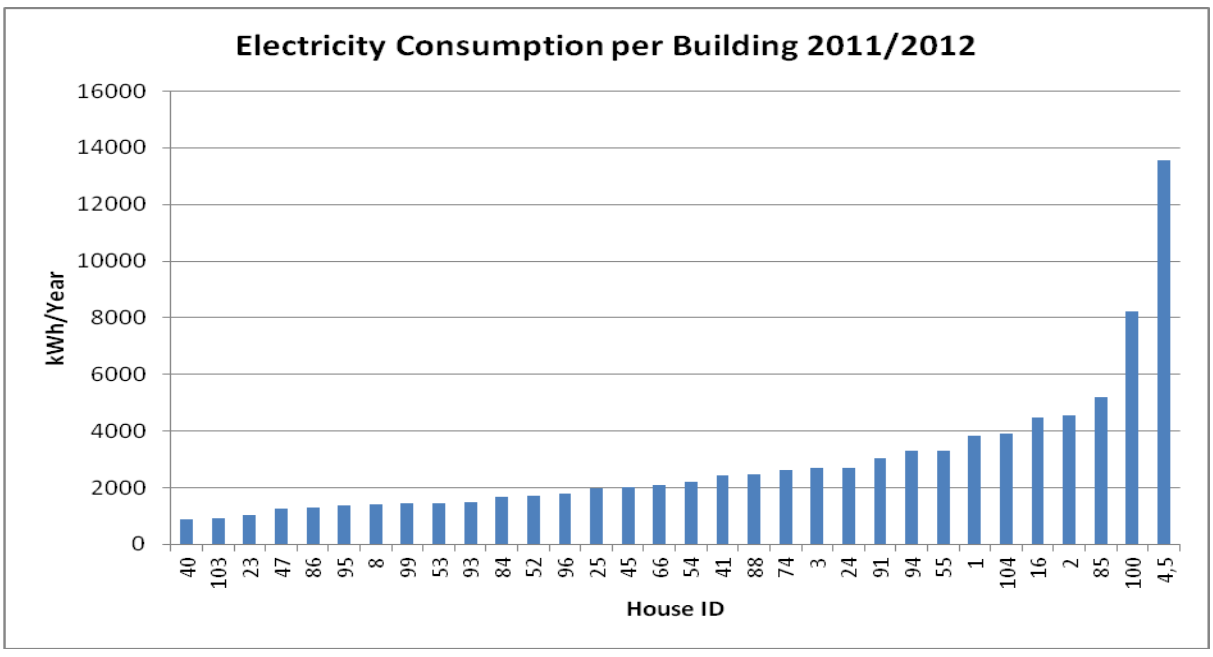

Figure 3-13: Electricity consumption for buildings in the Eco Village 2011/2012

3.2.5.3 Training and Support for Residents

SPIL has supported its own internal training for residents in the operation and basic understanding of the District Heating System and the interface controls. A 'Heat Users Group (HUG)' has been established who are the first point of contact for residents with regard to queries on the operation and control of the house heating controls. The HUG have produced a user friendly manual for the operation of the Merlin Controler (house interface control unit). The HUG are also active in the data collection mentioned earlier and they play an active role in bringing issues to the attention of the SPIL management for resolution with the equipment suppliers.

During the rollout and installation of the Efergy transmitters & monitors in the dwellings, and also during the subsequent house visits to retrieve data, the householders have been shown how to read & understand their monitors and reminded of the need to have spare batteries available etc.
They have also been provided with Efergy software which enables them to view & monitor their own house electricity data on their pcs (from downloaded files). Support is also available from the Heat Users Group to all householders in terms of how to reduce electricity consumption.

3.2.6 Presidential Visit to Eco Village

On Wednesday the 6th of June 2012, President Michael D. Higgins visited Cloughjordan. The President was greeted by residents and welcomed to the village by North Tipperary County Councilor Jim Casey

Figure 3-14: President of Ireland, Michael D Higgins, visits Eco Village.

The main objective of the Presidents visit was to see the new ecovillage development in Cloughjordan and to launch the annual Convergence festival, a national series of events focused on sustainability organised by Cultivate Living and Learning who are now based in the Eco Village in Cloughjordan. The main event of Convergence 2012 was held in Dublin's City Hall on the 20th of June, which coincides

with the UN Conference celebrating the 20th Anniversary of the Earth Summit in Rio de Janeiro, which President Michael D Higgins attended in 1992.

At the ecovillage the President was shown the infrastructure of the new sustainable neighbourhood of Cloughjordan. President Higgins met the children of the area and planted a tree at Django's Eco Hostel before visiting one of the eco-houses. Then the President took to the stage to address the hundreds of people who had gathered to hear him.

Figure 3-15: President Addresses the Gathering

President Higgins opened his speech by saying, "It is such a wonderful pleasure to be in a community that represents the future, that represents possibilities, that represents life, and which is surrounded by the values that are the basis for sustainable and real living on our planet."

Figure 3-16: President with Local Children